

Invited presentation for TMS Annual Meeting, March 15-19, 2015, Orlando, FL

Session: Integrative Materials Design II: Performance and Sustainability

“EBF³ Design and Sustainability Considerations”

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Electron beam freeform fabrication (EBF³) is a cross-cutting technology for producing structural metal parts using an electron beam and wire feed in a layer-additive fashion. This process was developed by researchers at NASA Langley to specifically address needs for aerospace applications. Additive manufacturing technologies like EBF³ enable efficient design of materials and structures by tailoring microstructures and chemistries at the local level to improve performance at the global level. Additive manufacturing also facilitates design freedom by integrating assemblies into complex single-piece components, eliminating flanges, fasteners and joints, resulting in reduced size and mass. These same efficiencies that permit new design paradigms also lend themselves to supportability and sustainability. Long duration space missions will require a high degree of self-sustainability. EBF³ is a candidate technology being developed to allow astronauts to conduct repairs and fabricate new components and tools on demand, with efficient use of feedstock materials and energy.